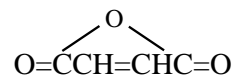


## MALEIC ANHYDRIDE

Maleic anhydride is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 108-31-6

Molecular Formula:  $C_4H_2O_3$



Maleic anhydride forms orthorhombic needles from chloroform. It has a choking, irritating odor. It is a corrosive material and is soluble in water, alcohol, acetone and ethyl acetate (Merck, 1989).

### Physical Properties of Maleic Anhydride

Synonyms: 2,5-furandione; cis-butenedioic anhydride; dihydro-2,5-dioxofuran

|                           |                               |
|---------------------------|-------------------------------|
| Molecular Weight:         | 98.06                         |
| Boiling Point:            | 202 °C                        |
| Melting Point:            | 52.8 °C                       |
| Density/Specific Gravity: | 1.48 (water = 1)              |
| Vapor Pressure:           | 0.41 mm Hg at 25 °C           |
| Conversion Factor:        | 1 ppm = 4.0 mg/m <sup>3</sup> |

(Howard, 1990; Merck, 1989; U.S. EPA, 1994a)

## SOURCES AND EMISSIONS

### A. Sources

Maleic anhydride is used in the manufacture of alkyd and polyester resins, surface coatings, agricultural chemicals, copolymers, malic and fumaric acids, and as an oil additive (Sax, 1987).

The primary stationary sources that have reported emissions of maleic anhydride in California are sources that manufacture or use plastic materials and synthetics, manufacturers of soaps, cleaners, and toilet goods, and national security installations (ARB, 1997b).

### B. Emissions

The total emissions of maleic anhydride from stationary sources in California are estimated to be at least 4,900 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

### C. Natural Occurrence

No information about the natural occurrence of maleic anhydride was found in the readily-available literature.

### **AMBIENT CONCENTRATIONS**

No Air Resources Board ambient concentration data exist for maleic anhydride.

### **INDOOR SOURCES AND CONCENTRATIONS**

No information on indoor sources and concentrations of maleic anhydride was found in the readily-available literature.

### **ATMOSPHERIC PERSISTENCE**

Maleic anhydride exists in the atmosphere in the gas phase. The dominant chemical loss process for maleic anhydride is by reaction with the hydroxyl (OH) radical. The calculated half-life and lifetime of maleic anhydride due to its reaction with the OH radical are 7 days and 10 days, respectively. Formic acid is observed as a product of this reaction (Bierbach et al., 1994).

### **AB 2588 RISK ASSESSMENT INFORMATION**

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of December 1996, for non-cancer effects, maleic anhydride contributed to the total hazard index in 1 of the approximately 89 risk assessments reporting a total chronic hazard index greater than 1, and presented an individual hazard index greater than 1 in 1 of these risk assessments. Maleic anhydride also contributed to the total hazard index in 2 of the approximately 107 risk assessments reporting a total acute hazard index greater than 1, and presented an individual hazard index greater than 1 in 1 of these risk assessments (OEHHA, 1996b).

### **HEALTH EFFECTS**

Probable routes of human exposure to maleic anhydride are inhalation and dermal contact (Howard, 1990).

Non-Cancer: Maleic anhydride is both a skin and respiratory sensitizer. Inhalation exposure to maleic anhydride may cause irritation to the respiratory tract, eyes, and skin. Long-term inhalation exposure to maleic anhydride may cause chronic bronchitis, asthma, pulmonary edema, upper respiratory tract irritation, eye irritation, and dermatitis. Rats exposed to maleic anhydride via gavage developed renal lesions (U.S. EPA, 1994a).

An acute non-cancer Reference Exposure Level (REL) of 10 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and a chronic REL of  $2.4 \mu\text{g}/\text{m}^3$  are listed for maleic anhydride in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines. The toxicological endpoint considered for chronic toxicity is the respiratory system, and the endpoint for acute toxicity is respiratory irritation (CAPCOA, 1993). The United States Environmental Protection Agency (U.S. EPA) has established an oral Reference Dose of 0.1 milligrams per kilogram per day for maleic anhydride based on renal lesions in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not result in the occurrence of chronic, non-cancer effects. The U.S. EPA has not established a Reference Concentration (RfC) for maleic anhydride (U.S. EPA, 1994a).

No information is available on adverse reproductive or developmental effects of maleic anhydride in humans. In one study, abnormalities were reported in the offspring of mice exposed by injection. No teratogenic or fetotoxic effects were observed in the offspring of rats exposed via gavage or diet (U.S. EPA, 1994a).

Cancer: No information is available regarding the carcinogenic effects of maleic anhydride in humans, and there is limited evidence in animals. The U.S. EPA has not classified maleic anhydride because it has not been adequately tested for potential carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified maleic anhydride with respect to potential carcinogenicity (IARC, 1987a).

